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UU	UU	UU	UU		19b. TELEPHONE NUMBER: 601-266-5296

RPPR Final Report
as of 11-Jun-2018

Agency Code:

Proposal Number: 69648CHCF **Agreement Number: W911NF-16-1-0398**
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Report Date: 14-Jan-2017 Date Received: 20-Nov-2017
Final Report for Period Beginning 15-Jul-2016 and Ending 14-Oct-2016
Title: Conference Support: Polymer Composites and High Performance Materials Workshop
Begin Performance Period: 15-Jul-2016 **End Performance Period:** 14-Oct-2016
Report Term: 0-Other

Submitted By: Sarah Morgan Email: sarah.morgan@usm.edu
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STEM Degrees: **STEM Participants:** 2

Major Goals: The Polymer Composites and High Performance Materials Workshop seeks to bring together researchers from industrial, academic and government laboratories to discuss the state-of-the-art in polymer matrix science for aerospace, marine and infrastructure applications, and to define key materials development challenges to meet the needs of Department of Defense and U.S. infrastructure emerging requirements. The proposed request for $2000 will support funding for two graduate students to attend the conference and present posters of their research. The program is organized to facilitate interaction among researchers, with a “Gordon Conference” style schedule, consisting of morning and evening talks and poster sessions, planned discussion sections, and free afternoons for informal networking. Graduate student participants will gain perspective of current research advances in polymer matrix science, emerging material needs to support the safety and health of our nation, and develop their professional network for future career advancements. The workshop is organized through the Polymer Chemistry Division of the American Chemical Society. It will take place July 25-28, 2016, in Santa Rosa, California.

Accomplishments: The Polymer Composites and High Performance Materials Workshop was offered as a 4-day workshop and professional networking session July 25 - 28, 2016 in Santa Rosa, California USA. This 3rd in a series workshop brought together researchers from industrial, academic and government laboratories to discuss the state-of-the-art in polymer matrix composite science for aerospace, marine and infrastructure applications. The purpose of this workshop was to address key challenges and advances in the area of polymer composites and nanocomposites, with specific emphasis on addressing fundamental structure-processing-property issues. Sessions were organized to present advancements in applications, nanocomposites, nano- and hybrid-materials, molecular interactions, sustainable materials, and functional materials, and spanned theoretical, experimental, and newly commercialized materials. A poster session and evening receptions were held to encourage discussion and interaction among participants. Attendance remained strong throughout the four-day workshop.

The ARO provided funding of $2000 to support the travel expenses and registration for two graduate students, Levi Moore and Matthew Patterson, to attend the conference and present the results of their research in the poster session. The students are doctoral candidates in polymer science and engineering at The University of Southern Mississippi. The full program with authors and papers presented are attached.

Training Opportunities: Nothing to Report

Results Dissemination: Abstracts are available to all registered participants at the ACS POLY website. http://www.polyacs.org/647.html

RPPR Final Report
as of 11-Jun-2018

Honors and Awards: Nothing to Report

Protocol Activity Status:

Technology Transfer: Nothing to Report

PARTICIPANTS:

Participant Type: Graduate Student (research assistant)
Participant: Levi M J Moore
Person Months Worked: 1.00 **Funding Support:**
Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

Participant Type: Graduate Student (research assistant)
Participant: Matthew A Patterson
Person Months Worked: 1.00 **Funding Support:**
Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

Polymer Composites and High Performance Materials

July 25-28, 2016
Hilton Sonoma Hotel
Santa Rosa, California

Monday, July 25, 2016

2:00 pm	**REGISTRATION OPENS**	
2:45 pm	**Opening Remarks, Sarah Morgan**	
	Session 1- Applications	
	Session Chair- Michael Meador	
3:00 pm	**Erik Sapper, The Boeing Company** *Replication and Simulation of Polymer Material Failure Modes*	**1**
3:25 pm	**Matteo Pasquali, Rice University** *Soft Conductors from Nanoscale Carbon*	**2**
3:50 pm	**Nagesh Potluri, Zyvex Technologies** *Carbon Nanotubes: Is it Finally Time for the Values to Exceed the Hype?*	**3**
4:15 pm	**BREAK**	
5:00 pm	**Younsuk Jung, Samsung Advanced Institute of Technology, KOREA** *Polymer Separator and Protecting Layer in Lithium Based Batteries*	**4**
5:25 pm	**Jennette M. Garcia, IBM Almaden** *Engineering Polymers from Secondhand Materials*	**5**
5:55 pm	**Jamie Grunlan, Texas A&M University** *Generating Voltage From Body Heat: Fully Organic Thermoelectric Nanocomposites With Power Factors Exceeding Bismuth Telluride*	**6**
6:20 pm	**ADJOURN**	
6:30 pm	**OPENING RECEPTION**	

Tuesday, July 26, 2016

7:30 am	**CONTINENTAL BREAKFAST**	
	Session 2- Nanocomposites	
	Session Chair: Jeffrey Gilman	
8:30 am	**Satish Kumar, Georgia Tech** *Developments in Polymer/Carbon Nanotube Nanocomposites*	**7**
8:55 am	**Aaron Forster, NIST** *Durability of Carbon Nanotube Network Polymer Composites*	**8**

Continued – Tuesday, July 26, 2016

9:20 am	**Richard Liang, Florida State University** *Unusual Geometry Constrained Self-assembling and Long Range Order of CNT Materials for High Structural Performance*	**9**
9:45 am	**J. Alexander Liddle, NIST** *Carbon Nanocomposites: Structure, Processing, Properties*	**10**
10:10 am	**BREAK**	
10:30 am	**Bharath Natarajan, NIST, Georgetown University** *Revealing Structure-Property Relations in Aligned Carbon Nanotube - Polymer Composites via Quantitative 3D Electron Tomography*	**11**
10:55 am	**Barry Farmer, AFRL** *Understanding Thermal Conductance Across Multi-Wall Carbon Nanotube Contacts: Role of Nanotube Curvature*	**12**
11:20 am	**Sinan Keten, Northwestern University** *Understanding Nanoconfinement and Nanoscale Interfaces in Structural Nanocomposites*	**13**
11:45 am	**Cate Brinson, Northwestern University; Linda Schadler, Rennselaer Polytechnic Institute** *Stalking the Materials Genome: A Data-Driven Approach to the Virtual Design of Nanostructured Polymers (Two presentations)*	**14**
12:35 pm	**ADJOURN FOR LUNCH (ON YOUR OWN)**	
4:45 pm	**AFTERNOON REFRESHMENTS**	
	Session 3 – Nano- and Hybrid Materials	
	Session Chair: Mary Ann Meador	
5:00 pm	**Erik Berda, University of New Hampshire** *Functional Nanomaterials from Single Polymer Chains*	**15**
5:25 pm	**Ramanan Krishnamoorti, University of Houston** *Grafted Nanoparticles: Role of Entanglements on Dynamics in Solutions and Melts*	**16**
5:50 pm	**Emily Pentzer, Case Western Reserve University** *Assembly of Graphene Oxide Nanosheets at the Oil-Water Interface to make Tailored Composite Materials*	**17**
6:15 pm	**Melissa Grunlan, Texas A&M University** *Thermoresponsive Nanocomposite Hydrogels as Self-cleaning Membranes for Implanted Glucose Biosensors*	**18**
6:40 pm	**Gary Beall, Texas State University** *Highly Ordered Self –Assembling Polymer/Clay Nanocomposite Barrier Film*	**19**
7:05 – 8:30 pm	**POSTER SESSION AND RECEPTION**	

Wednesday, July 27, 2016

7:30 am	**CONTINENTAL BREAKFAST**	
	Session 4 – Molecular Interactions	
	Session Chair: Frederick Phelan, Jr.	
8:30 am	**Dave Hartman, Owens Corning** *Industrial Perspective on the Importance of the Interphase in Composite Materials*	**20**
8:55 am	**Frank Blum, Oklahoma State University** *Polymers at Interfaces in Composites*	**21**
9:20 am	**Melissa Pasquinelli, North Carolina State University** *Sustainable Polymer Science: Tuning the Interfacial Characteristics of Bi-component Polymer Materials via Molecular Simulations*	**22**
9:45 am	**Joe Mabry, AFRL** *Molecular Design of Polymer Composite Materials for Rocket and Missile Applications*	**23**
10:10 am	**BREAK**	
10:25 am	**Pieter in 't Veld, BASF** *Industrial Approach to Multiscale Modeling of Soft Materials*	**24**
10:50 am	**Hilmar Koerner, AFRL** *New Hybrid Materials and Processes for High Temperature Aerospace Applications*	**25**
11:15 am	**Jan Andzelm, ARL** *Modeling of Polymer Networks and Polyethylene Fibers*	**26**
11:40 am	**Jay Schieber, Illinois Institute of Technology** *Nonlinear Rheology Predictions of Highly Entangled Polymers from Hypothesis-Driven Coarse Graining*	**27**
12:05 pm	**Yelena Sliozberg, ARL and SURVICE Engineering Company** *Modeling of Polymer Gels and Biological Materials*	**28**
12:30 pm	**ADJOURN FOR LUNCH (ON YOUR OWN)**	
4:45 pm	**AFTERNOON REFRESHMENTS**	
	Session 5 – Sustainable Materials	
	Session Chair: Sarah Morgan	
5:00 pm	**Jeffrey Gilman, NIST** *Interphase Imaging and High Performance Surface Modified Nanocellulose Composites*	**29**
5:25 pm	**Dave Schiraldi, Case Western Reserve University** *Bio-based, Low Flammability Aerogel Composites*	**30**
5:50 pm	**Sameer S. Rahatekar, University of Bristol, UK** *Cellulose and Chitin Nanocomposites for Engineering and Biomedical Applications*	**31**
6:15 pm	**ADJOURN**	

Thursday, July 28, 2016

7:30 am	**CONTINENTAL BREAKFAST**	
	Session 6 – Functional Materials	
	Session Chair: Daniel Savin	
8:30 am	**Mathew Celina, Sandia National Laboratory** *Challenges for Epoxy Cure Characterization and Long Term High Temperature Performance*	**32**
8:55 am	**Rajesh Khare, Texas Tech University** *Design of Polymeric Pervaporation Membranes for Energy Efficient Separation of Alcohol-Water Mixtures*	**33**
9:20 am	**Daniel Schmidt, University of Massachusetts Lowell** *Fiber Reinforcement and Reworkability in Bio-Based Epoxy Resins*	**34**
9:45 am	**Gale Holmes, NIST** *The Interphase in E-Glass/Epoxy Composites: Some Thoughts on How the Epoxy-Amine Reaction Kinetics Maybe Perturbed by Silane Coupling Agents*	**35**
10:10 am	**BREAK**	
10:35 am	**Phil Costanzo, California Polytechnic State University** *Incorporating Diels-Alder Chemistry to Prepare Thermally-Responsive Materials*	**36**
10:55 am	**Randy Erb, Northeastern University** *Designing Complex Composite Architectures via 3D Magnetic Printing*	**37**
11:20 am	**Andrew Guenther, AFRL** *Hydrolytic Network Structure Degradation in Multi-Component Polycyanurate Networks*	**38**
11:45 am	**CLOSING REMARKS**	
12:10 pm	**ADJOURN**	

Polymer Composites and High Performance Materials

July 25-28, 2016
Hilton Sonoma Hotel
Santa Rosa, California

Poster Session

Tuesday, July 26, 2016

7:05 – 8:30 pm	**Poster Session and Reception**

Mariam Al and **AAli Al Maadeed** *Tailoring Nanocomposites with Modified Processing Techniques and Selected Additives, Current Status and Future Applications*	**1**
Open	**2**
Cynthia Corley, Scott Iacono, and Allen Schoffstall *New Difunctional Perfluoropyridine-Based Compounds for Advanced Polymer Applications*	**3**
Randall Erb *TBD*	**4**
Deep Kalita, Mukund Sibi, and Bret J. Chisholm *Oxidatively-Cured Coatings from Renewable-Based Poly(vinyl ether)s*	**5**
Fardin Khabaz and Rajesh Khare *Dynamic Coupling between Solvent Molecules and Hydrated Polyacrylate Gels*	**6**
Ketan S. Khare and **Frederick R. Phelan Jr** *Mechanophores for Polymer Composites Metrology - Insight from Density Functional Theory*	**7**
Gary Kushto and Mason A. Wolak *Fully Flexible Polymer/Polymer-Nanoparticle Composite One-Dimensional Photonic Bandgaps Via In Situ Production of Metal Chalcogenide Nanoparticles*	**8**
Jena McCollum and Scott Iacono *Production of Solid Structure Energetic Materials by Melt Processing*	**9**
Mary Ann B. Meador, Stephanie L. Vivod, Baochau Nguyen, Haiquan Guo, and Rocco P. Viggiano *Polyimide and Polyamide Aerogels: Properties and Potential from Aerospace to Commercial Applications*	**10**
Levi Moore, Mithun Bhattacharya, Qi Wu, and Sarah E. Morgan *Morphology Control and Increased Hole Mobility in Polymer Photovoltaics via Solvent Vapor Annealing*	**11**
Sarah E. Morgan, Qifeng Jin, John M. Misasi, Katrina M. Knauer, and Jeffrey S. Wiggins *Enhanced Toughness Epoxy Matrices through Incorporation of Hyperbranched Polymers*	**12**

Poster Session cont'd, Tuesday, July 26, 2016

Matt Patterson *Distortional Aryl Ketone Ether Hybrid Epoxy Matrices*	**13**
Emily Pentzer *Preparation and Assembly of Asymmetrically Functionalized Graphene Oxide Nanosheets*	**14**
Frederick R. Phelan Jr., Thomas Rosch, Cheol Jeong, Brian Moroz, and Sharief Youssef *Development of a Digital Data Infrastructure to Support Multiscale Modeling of Soft Materials for the Materials Genome Initiative (MGI)*	**15**
Olivia D. McNair and **Daniel A. Savin** Tuning the T_g and Energy Damping Capabilities of Thiol-Ene Networks	**16**
Andreas Bick and **Lalitha Subramanian** *Property Prediction for Epoxy/Graphene Composites Using Multiscale Modeling*	**17**
Po-Hsiang Wang, Sushanta Ghoshal, Prabhakar Gulgunje, Nikhil Verghese, and Satish Kumar *High Impact Strength Polypropylene Containing Carbon Nanotubes*	**18**
Mason A. Wolak, Gary Kushto, Lei Zhu, and Eric Bae *Structure and Failure Analysis of Polymer Composites via Tandem Focused Ion Beam (FIB) / Scanning Electron Microscopy (SEM)*	**19**